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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Gady

Serial No.: 10/666,712

Filed: 9/18/2003

Group Art Unit: 3611

Examiner: Depumpo, Daniel G.

For: AUTOMATIC AXLE TRACTION CONTROL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

In response to the Notification of Non-Compliant Appeal Brief dated July 21, 2005, appellant now re-submits its Appeal Brief pursuant to the Notice of Appeal filed March 7, 2005, with the proper appendices attached thereto. The fee for the appeal brief has already been paid. Any additional fees or credits may be charged or applied to Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds.

REAL PARTY IN INTEREST

The real party in interest is Meritor Heavy Vehicle Technology, LLC assignee of the present invention.

RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings related to this appeal, or which may directly affect or may be directly affected by, or have a bearing on, the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 15-35 are pending, rejected, and appealed. Claims 1-14 have been cancelled.

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

The subject invention is directed to an automatic axle engagement system that utilizes wheel speed sensors, engine control, and braking control to provide optimal engagement of a front drive axle to provide all wheel drive under poor driving conditions. The system includes a transfer case that is coupled to a power source and which has output shafts for front and rear drive axles. Wheel sensors generate wheel speed signals that are transmitted to a controller, which determines whether or not there is wheel slip. The controller initiates a shift to engage the front drive axle if there is wheel slippage by controlling one or both of the output torque or axle braking forces to bring rotational speeds of front and rear output shafts within a predetermined speed range.

An example of a vehicle powertrain 10 is shown in Figure 1. The powertrain 10 includes a front drive axle 12 having a center differential 14 for driving a first pair of axle shafts 16 coupled to front wheels 18, and a rear drive axle 20 with a center differential 22 for driving a second pair of axle shafts 24 coupled to rear wheels 26. See paragraph [12].

A power source 28 provides the driving torque to drive the axles 12, 20. A transfer case 30 is used to transfer the driving torque from the power source 28 to the front 12 and rear 20 drive axles. Typically, the rear drive axle 20 is always engaged with the transfer case 30 to provide the vehicle with rear wheel drive. The front drive axle 12 is selectively engagable with the transfer case 30 to provide all wheel drive under predetermined conditions. When ground conditions are poor, such as when there is ice or mud, vehicle control, i.e., tractive effort, is improved when all wheels 18, 26 are provided with driving torque. However, it is undesirable to have all wheel drive when ground conditions are good because all wheel drive adversely affects fuel economy and vehicle maneuverability. See paragraph [13].

A control system determines when conditions are optimal to engage and disengage the front drive axle 12. The control system monitors ground conditions and includes a central processor or electronic control unit (ECU) 32 that generates a power source control signal 34 and/or a wheel control signal 36 to provide optimal conditions for axle engagement. The ECU 32 sends a transfer case control signal 38 to initiate shift engagement once the ECU 32 determines that conditions are optimal. See paragraph [15].

As shown in Figure 2, each of the wheels 18, 26 includes a braking mechanism 40 for a brake-by-wire system. Wheel sensors 42 are used to determine wheel speed for each of the wheels 18, 26 and generate wheel speed signals 44 that are transmitted to the ECU 32. By

utilizing wheel speed information, the ECU 32 can determine whether or not there is wheel slippage, i.e., poor ground conditions. Once the ECU 32 determines whether or not there is wheel slip the ECU determines whether speed conditions for the transfer case 30 and axles 12, 20 are optimal to initiate a shift. See paragraph [16].

As shown in Figure 3, the transfer case 30 includes an input shaft 50 that is coupled to the output of the power source 28. The transfer case 30 also includes a rear axle output shaft 52 that is coupled to the rear drive axle 20 and a front axle output shaft 54 that is selectively engaged with the front drive axle 12. A gear assembly 60 drivingly connects the input shaft 50 to the rear axle output shaft 52. See paragraph [17].

A declutch mechanism 62 is used to driving engage the front axle output shaft 54 to the rear axle output shaft 52 to engage the front drive axle 12. The declutch 62 includes an electrical connector 64 to connect the declutch 62 to the ECU 32. See paragraph [18].

In order for the ECU 32 to initiate engagement of the front drive axle 12, the front axle output shaft 54 and the rear axle output shaft 52 must both be within a predetermined speed range. If both shafts 52, 54 are within the predetermined speed range the ECU 32 generates a signal and the declutch 62 couples both shafts 52, 54 together. When engaged, the front 54 and rear 52 shafts rotate at the same speed. If the both shafts 52, 54 are not within the predetermined range, the ECU 32 initiates various control signals to provide a controlled shift by bringing both shafts 52, 54 within the predetermined range. See paragraph [19] and [23].

The ECU 32 controls the shaft speeds by generating a power source control signal 34 to control the output torque and/or generating a braking control signal 36 to control wheel brake torque to bring the both shafts 52, 54 within the predetermined rotational speed range. The

braking torque and power source output torque can be separately controlled or simultaneously controlled depending upon the ground conditions and wheel speeds. See paragraph [21]. When the ground conditions improve, i.e., there is no longer any wheel slip, the ECU 32 signals 38 the transfer case declutch mechanism 62 to disengage from the front drive axle 12. See paragraph [22].

The subject control system for axle engagement and disengagement that takes into account input and output shaft speeds of the transfer case as well as ground conditions to provide optimal axle engagement shifts. The automated control system determines if there is slippage by sensing wheel speeds. If wheel slip is detected, the ECU 32 uses a defined logic matrix to initiate a controlled shift for front axle engagement. This controlled shift forces the front output shaft 54 and the rear output shaft 52 to be within the predetermined range by interrupting power source output torque along with sequencing a controlled wheel brake signal 36. When the speed range requirement is satisfied, the shift is initiated to engage the front axle. Once the axle is engaged, the power source output torque resumes and the brakes 40 are released. See paragraph [23].

Independent claim 15 recites a transfer case assembly that includes an input shaft adapted for coupling to a power source, a first axle output shaft driven by the input shaft, a second axle output shaft selectively driven by the input shaft, and a clutch mechanism that couples the second axle output shaft to the first axle output shaft. See paragraphs [17] and [18] and Figure 3. Claim 15 also recites the feature of a controller that controls activation of the clutch mechanism by comparing rotational speeds of the first and second axle output shafts to each other, generating a control signal to bring the rotational speeds of the first and second axle output shafts within a

common rotational speed range if rotational speeds of the first and second axle output shafts differ from each other by a predetermined amount, and activating the clutch mechanism to couple the first and second axle output shafts together during a wheel slippage condition when rotational speeds of the first and second axle output shafts are within the common rotational speed range. See paragraph [23] and Figure 2.

Independent claim 26 is directed to a method for coupling a transfer case to a drive axle during wheel slippage that includes the steps of: providing an input shaft adapted to be coupled to a power source, a first axle output shaft driven by the input shaft, a second axle output shaft selectively driven by the input shaft, and a clutch mechanism for coupling the second axle output shaft to the first axle output shaft. See paragraphs [17] and [18] and Figure 3. Claim 26 also includes the steps of: comparing rotational speeds of the first and second axle output shafts to each other, generating a control signal to bring the rotational speeds of the first and second axle output shafts within a common rotational speed range if the rotational speeds of the first and second axle output shafts are different from each other by a predetermined amount, and activating the clutch mechanism to couple the first and second axle output shafts together during a wheel slippage condition once the rotational speeds of the first and second axle output shafts are within the common rotational speed range. See paragraph [23] and Figure 2.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 15-23 and 25-35 stand rejected under 35 U.S.C. 102(e) as being anticipated by Yasuda (US 6115663).

Claim 24 stands rejected to under 35 U.S.C. 103(a) as being unpatentable over Yasuda (US 6115663) alone.

Claims 34 and 35 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

ARGUMENT

A. Anticipation Rejection Over Yasuda

The examiner has argues that claims 15-23 and 25-35 are fully anticipated by Yasuda. Appellant disagrees.

Claim 15

Claim 15 requires that the clutch mechanism couple the first and second axle output shafts together during a wheel slippage condition when rotational speeds of the first and second axle output shafts are within a common rotational speed range. The examiner argues that Yasuda inherently discloses this. Applicant respectfully disagrees.

There is absolutely no teaching in Yasuda of a controller for controlling activation of the clutch mechanism wherein the controller compares rotational speeds of the first and second axle output shafts to each other, generates a control signal to bring the rotational speeds of the first and second axle output shafts within a common rotational speed range if rotational speeds of the first and second axle output shafts differ from each other by a predetermined amount. Further, there is no teaching in Yasuda of a transfer case that couples the front and rear axle output shafts together when transfer case rotational shaft speeds are within a predetermined speed range.

Yasuda discloses a traction control and torque splitting control for a four wheel drive vehicle. An engine 4 of the four wheel drive vehicle transmits driving power to a rear wheel differential gear assembly 21 via a transmission 6 and drive shaft 20. The rear wheel differential gear assembly 21 drives rear axle shafts 22 that drive rear wheels RL, RR.

A portion of the drive power of the engine 4 is also input to left and right front wheels FL and FR. This drive power is transmitted via a clutch 31, a transfer gear assembly 32, a front wheel differential gear assembly 33, and front axle shafts 34. "The clutch 31 is operated by an actuator 14 which is controlled by a drive power controller 1 which comprises a microcomputer or the like so as continuously to change the apportionment of the transmitted torque between the front wheels FL and FR and the rear wheels RL and RR from 0:100 to 50:50." Column 2, lines 58-63.

Wheel speed sensors 12FR, 12FL, 12RR, and 12RL and power controller 1 are used to detect whether or not the wheels FR, FL, RR, and RL are skidding. If the rear wheels RR, RL are skidding the power controller 1 changes the apportionment of torque transmitted between the front wheels FL, FR and the rear wheels RR, RL. As such, "when the rear wheels RR and RL skid, the drive power controller 1 first operates the traction control system, and thereafter operates the torque splitting control system, and thereby the rear wheels RR and RL are prevented from skidding." Column 3, lines 48-52. At all times, i.e. during skidding or otherwise, the front axle is engaged.

Thus, Yasuda discloses a very different system from that of appellant's. Yasuda proposes an application of traction control and torque spitting control to address wheel skid. Torque splitting in Yasuda is integrated into traction control software. See column 3, line 53 to

column 4, line 67. Appellant's system is a mechanical system that requires a clutch to be shifted to actively engage the front drive axle. This does not occur in Yasuda.

As discussed above, Yasuda provides a drive power control device that detects skidding of a rear drive wheel, a traction control system that reduces the drive power to the rear wheels, and a torque splitting control system that increases the proportion of drive power apportioned to the front drive wheels to prevent the rear wheels from skidding. A microprocessor is programmed to start the traction control system upon detection of skidding and subsequently starts the torque splitting control system to prevent skidding.

Appellant's system does not modulate a torque splitting device to proportion drive power. When slippage is identified in appellant's system, engine power is interrupted to allow the front drive axle to be engaged in a controlled manner. This engagement does not proportion torque. Yasuda proportions torque between the front and rear axles via clutch 31. Again, Yasuda does not disclose any type of controlled shifting for engagement of a front axle.

Further, the examiner argues that Yasuda discloses that "a clutch 31 is activated to couple the axle output shafts together as discussed at col. 3, lines 48-53." Appellant disagrees with this characterization of Yasuda. Appellant's claimed clutch couples the front and rear axle output shafts together. The clutch 31 in Yasuda changes the apportionment of transmitted torque between the front and rear wheels. The clutch 31 does not couple and uncouple front and rear axle output shafts in a transfer case assembly.

Both the front and rear axles in Yasuda are continuously driven under all vehicle operating conditions, thus there is no need for a clutch that couples and uncouples front and rear axle output shafts in a transfer case. As both axles in Yasuda are continuously driven, Yasuda

addresses skidding problems by continuously changing the apportionment of torque between the front and rear wheels.

Again, this is very different from appellant's claimed invention. Appellant's system does not modulate drive power to continuously change the apportionment of transmitted torque. Appellant controls drive power to control relative speed of the two axle output shafts from the transfer case to allow the first and second axle output shafts to be coupled together during a wheel slippage condition when rotational speeds of the first and second axle output shafts are within a common rotational speed range.

Thus, for the many reasons set forth above, Yasuda does not anticipate claim 15. For similar reasons Yasuda does not anticipate claim 26.

Claim 16

Yasuda also does not anticipate dependent claim 16. Claim 16 includes the feature of the controller automatically activating the clutch mechanism during a wheel slippage condition only if rotational speeds of the first and second output shafts are within a common rotational speed range.

For the reasons set forth above, Yasuda does not disclose the use of a clutch mechanism that couples and uncouples front and rear output shafts in a transfer case. Further, Yasuda makes no mention of the rotational speeds of such shafts, and does not disclose any method or structure that brings such shafts into a common speed range.

Yasuda certainly does not disclose automatic activation of a clutch mechanism to couple the front and rear output shafts together during wheel slip only if the rotational speeds of the first and second shafts are within a common rotational speed range. Thus, Yasuda does not anticipate claim 16.

Claims 17-19 and 27-29

Yasuda also does not anticipate dependent claim 17. Claim 17 requires the controller to control at least one of a power source output torque or a wheel braking force to bring rotational speeds of the first and second output shafts within the common rotational speed range during the wheel slippage condition.

Yasuda does not disclose controlling power source torque or wheel braking to bring the two transfer case output shafts into a common speed range. Yasuda discloses performance of traction control to apportion torque between front and rear axles by increasing and decreasing fuel supplied to an engine or by increasing and decreasing braking forces. Appellant's invention does not limit traction control.

Appellant controls power source torque or wheel braking to bring the rotational speeds of transfer case output shafts into a common speed range such that the clutch mechanism can couple the transfer case axle output shafts together without damaging any components.

Yasuda simply does not disclose controlling the speed of transfer case axle output shafts for coupling purposes. Thus, Yasuda does not anticipate claim 17. For similar reasons, Yasuda also does not anticipate claims 18-19 and 27-29.

Claims 20 and 30

Yasuda also does not anticipate dependent claim 20. Claim 20 includes the feature that the controller simultaneously controls both the power source output torque and the wheel braking

force to bring rotational speeds of the first and second axle output shafts within the common rotational speed range prior to activating the clutch mechanism during the wheel slippage condition.

Yasuda discloses performance of traction control to apportion torque between front and rear axles by increasing and decreasing fuel injected to an engine. Optionally, Yasuda discloses performance of traction control to apportion torque between front and rear axles by increasing and decreasing braking forces. This is very different from appellant's invention.

With appellant's invention, if wheel slip is detected, the controller initiates a controlled shift for front axle engagement to force the front output shaft and the rear output shaft to be within the predetermined range by interrupting power source output torque along with sequencing a controlled wheel brake signal. When the speed range requirement is satisfied, the shift is initiated to engage the front axle by coupling the front and rear output shafts together. Once the axle is engaged, the power source output torque resumes and the brakes are released. Thus, appellant's controller simultaneously controls both the power source output torque and the wheel braking force to bring rotational speeds of the first and second axle output shafts within the common rotational speed range prior to activating the clutch mechanism.

Yasuda simply does not disclose such a control. Thus, Yasuda does not anticipate claim 20. For similar reasons, Yasuda does not anticipate claim 30.

<u>Claims 21 and 31</u>

Yasuda also does not anticipate dependent claim 21. Claim 21 includes the feature wherein the controller disengages the second axle output shaft from the first axle output shaft when there is no wheel slippage.

Yasuda discloses a system where both the front and rear axles are continuously engaged. The clutch 31 is used only to control apportionment of torque between the front and rear axles. The clutch 31 does not include any type of coupling mechanism that couples two transfer case output shafts together during a wheel slip condition.

Accordingly, the Yasuda system is incapable of disengaging or uncoupling the axle output shafts from each other. Thus, Yasuda does not anticipate claim 21. For similar reasons, Yasuda does not anticipate claim 31.

<u>**Claim 23**</u>

Yasuda also does not anticipate dependent claim 23. Claim 23 includes the feature wherein the clutch mechanism selectively couples the second axle output shaft for rotation with the first axle output shaft such that the input shaft drives both the first and second axle output shafts via the gear assembly.

Yasuda discloses a system where both the front and rear axles are continuously engaged. The clutch 31 in Yasuda is used only to control apportionment of torque between the front and rear axles. The clutch 31 does not include any type of coupling mechanism that couples two transfer case output shafts together during a wheel slip condition. Further, Yasuda does not disclose any type of clutch mechanism that provides selective coupling of shafts. Thus, Yasuda does not anticipate claim 23.

Claims 34 and 35

Yasuda also does not anticipate dependent claim 35. Claim 35 includes the feature wherein the second axle output shaft is only coupled to the first axle output shaft during a wheel slippage condition.

As discussed above, Yasuda discloses a system where both the front and rear axles are continuously engaged during vehicle operation, and a clutch mechanism is used to apportion torque between the front and rear axles to address wheel skidding. There is absolutely no disclosure in Yasuda of a system that only couples transfer case front and rear output shafts together during a wheel slip condition. Transfer gear assembly 32 is coupled to both the front axle and rear axle at all times. Thus, Yasuda does not anticipate claim 35. For similar reasons, Yasuda does not anticipate claim 34.

B. Obviousness Rejection Over Yasuda

Claim 24 stands rejected to under 35 U.S.C. 103(a) as being unpatentable over Yasuda alone. Claim 24 recites that the gear assembly includes at least a first gear directly coupled to the input shaft, a second gear directly coupled to the first axle output shaft, and a third gear in meshing engagement with the first and second gears to transfer driving input from the input shaft to the first axle output shaft.

The examiner admits that Yasuda does not disclose this feature. The examiner takes Official Notice that transfer cases commonly include three gears as claimed and argues that it would have been obvious to use such a transfer case in Yasuda. Appellant disagrees.

Yasuda discloses a system where the front and rear axles are continuously engaged during all vehicle conditions. Engine torque is supplied via a transmission 6 and drive shaft 20 to the rear axle. A transfer gear assembly 32 transmits engine torque to the front axle. A clutch 31 is used to apportion torque between the front and rear axles.

Appellant's invention is directed to transfer case assembly that includes a clutch mechanism that couples front and rear transfer case axle output shafts together. For the reasons set forth above in Section A, Yasuda does not disclose, suggest, or teach this feature. Further, appellant's claimed transfer case assembly includes an input shaft and gear assembly that operably couples the input shaft to the first axle output shaft for continuous driving engagement. The clutch mechanism of the claimed transfer case assembly selectively couples the second axle output shaft for rotation with the first axle output shaft such that the input shaft drives both the first and second axle output shafts via the gear assembly. The gear assembly has a three gear configuration as defined in claim 24.

As Yasuda provides continuous driving engagement for the front and rear axles, Yasuda would have no reason to utilize appellant's transfer case assembly as defined in claim 24. Thus, appellant requests that the rejection of claim 24 be reversed.

C. 35 U.S.C. 112, First Paragraph, Rejection

Claims 34 and 35 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. Specifically, the examiner argues that the recitation that the second output shaft is only coupled to the power source during a wheel slippage condition is not supported by the original specification. Appellant disagrees.

As set forth at paragraphs [19] and [23] of the subject application, in order for the ECU 32 to initiate engagement of the front drive axle 12, the front axle output shaft 54 and the rear axle output shaft 52 must both be within a predetermined speed range. If both shafts 52, 54 are within the predetermined speed range the ECU 32 generates a signal and declutch 62 couples both shafts 52, 54 together. If the both shafts 52, 54 are not within the predetermined range, the ECU 32 initiates various control signals to provide a controlled shift by bringing both shafts 52, 54 within the predetermined range. Thus, the second output shaft is only coupled to the power source, e.g., there is only engagement of the front drive axle if there is wheel slippage.

The examiner further argues that according to paragraph [22] the second output shaft is coupled to the power source for a brief time after wheel slippage has been controlled while the system determines when ground conditions have improved sufficiently. As set forth in paragraph [22], when the ground conditions improve, i.e., there is no longer any wheel slip, the ECU 32 signals 38 the transfer case declutch mechanism 62 to disengage from the front drive axle 12. However, when the axle is engaged, it may be difficult to determine when ground conditions have improved sufficiently. Thus, the system could utilize a control or transfer case mechanism to ensure that disengagement does not occur before the desired traction is achieved. However, once there clearly is no wheel slippage the front axle is automatically disengaged.

Appellant's invention is directed toward a system with a controller and transfer case assembly that cooperate to only engage the front axle during wheel slip to avoid unnecessary wear on front axle components and to provide controlled shifts. Applicant asserts that claims 34 and 35 are fully supported by the specification and respectfully requests that the 35 U.S.C. 112, first paragraph, rejection be reversed.

CONCLUSION

For the reasons set forth above, the rejection of all claims is improper and should be reversed. Appellant earnestly requests such an action.

Respectfully submitted,

CARLSON, GASKEY & OLDS

Kerrie A. Laba, Registration No. 42,777
400 W. Maple, Suite 350
Birmingham, MI 48009
(248) 988-8360

Dated: July 27, 2005

CERTIFICATE OF MAIL

I hereby certify that the enclosed re-submitted Appeal Brief is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 27th day of July, 2005.

Laura Combs

CLAIMS APPENDIX

1.-14. (Cancelled)

15. A transfer case assembly comprising:

an input shaft adapted to be coupled to a power source;

a first axle output shaft driven by said input shaft;

a second axle output shaft selectively driven by said input shaft;

a clutch mechanism for coupling said second axle output shaft to said first axle output shaft; and

a controller for controlling activation of said clutch mechanism wherein said controller compares rotational speeds of said first and second axle output shafts to each other, generates a control signal to bring said rotational speeds of said first and second axle output shafts within a common rotational speed range if rotational speeds of said first and second axle output shafts differ from each other by a predetermined amount, and activates said clutch mechanism to couple said first and second axle output shafts together during a wheel slippage condition when rotational speeds of said first and second axle output shafts are within said common rotational speed range.

16. The transfer case assembly according to claim 15 wherein said controller automatically activates said clutch mechanism during a wheel slippage condition only if rotational speeds of said first and second axle output shafts are within a common rotational speed range.

17. The transfer case assembly according to claim 15 wherein said controller controls at least one of a power source output torque or a wheel braking force to bring rotational speeds of said first and second axle output shafts within said common rotational speed range during the wheel slippage condition.

18. The transfer case assembly according to claim 17 wherein said controller only controls said wheel braking force to bring rotational speeds of said first and second axle output shafts within said common rotational speed range prior to activating said clutch mechanism during the wheel slippage condition.

19. The transfer case assembly according to claim 17 wherein said controller only controls power source output torque to bring rotational speeds of said first and second axle output shafts within said common rotational speed range prior to activating said clutch mechanism during the wheel slippage condition.

20. The transfer case assembly according to claim 17 wherein said controller simultaneously controls both said power source output torque and said wheel braking force to bring rotational speeds of said first and second axle output shafts within said common rotational speed range prior to activating said clutch mechanism during the wheel slippage condition.

21. The transfer case assembly according to claim 15 wherein said controller disengages said second axle output shaft from said first axle output shaft when there is no wheel slippage.

22. The transfer case assembly according to claim 15 including a gear assembly operably coupling said input shaft to said first axle output shaft for continuous driving engagement.

23. The transfer case assembly according to claim 22 wherein said clutch mechanism selectively couples said second axle output shaft for rotation with said first axle output shaft such that said input shaft drives both said first and second axle output shafts via said gear assembly.

24. The transfer case assembly according to claim 23 wherein said gear assembly includes at least a first gear directly coupled to said input shaft, a second gear directly coupled to said first axle output shaft, and a third gear in meshing engagement with said first and second gears to transfer driving input from said input shaft to said first axle output shaft.

25. The transfer case assembly according to claim 15 including a first drive axle with a first differential that receives driving input from said first axle output shaft, said first differential providing driving input to a first set of wheels and including a second drive axle with a second differential that selectively receives driving input from said second axle output shaft, said second differential providing driving input to a second set of wheels wherein said controller determines rotational speeds of said first and second sets of wheels to identify the wheel slippage condition.

26. A method for coupling a transfer case to a drive axle during wheel slippage comprising the steps of:

(a) providing an input shaft adapted to be coupled to a power source, a first axle output shaft driven by the input shaft, a second axle output shaft selectively driven by the input shaft, and a clutch mechanism for coupling the second axle output shaft to the first axle output shaft;

(b) comparing rotational speeds of the first and second axle output shafts to each other;

(c) generating a control signal to bring the rotational speeds of the first and second axle output shafts within a common rotational speed range if the rotational speeds of the first and second axle output shafts are different from each other by a predetermined amount; and

(d) activating the clutch mechanism to couple the first and second axle output shafts together during a wheel slippage condition once the rotational speeds of the first and second axle output shafts are within the common rotational speed range.

27. The method according to claim 26 wherein step (c) further includes the step of controlling at least one of a power source output torque or a wheel braking force to bring rotational speeds of the first and second axle output shafts within the common rotational speed range during the wheel slippage condition.

28. The method according to claim 27 including the step of only controlling wheel braking force to bring rotational speeds of the first and second axle output shafts within the common rotational speed range prior to step (d).

29. The method according to claim 27 including the step of only controlling power source output torque to bring rotational speeds of the first and second axle output shafts within the common rotational speed range prior to step (d).

30. The method according to claim 27 including the step of simultaneously controlling both the power source output torque and the wheel braking force to bring rotational speeds of the first and second axle output shafts within the common rotational speed range prior to step (d).

31. The method according to claim 26 including the step of disengaging the second axle output shaft from the first axle output shaft subsequent to step (d) when there is no wheel slippage.

32. The method according to claim 26 including the step of continuously driving the first axle output shaft with a gear assembly that is driven by the input shaft.

33. The method according to claim 26 including the steps of providing a first drive axle with a first differential that receives driving input from the first axle output shaft and a second drive axle with a second differential that selectively receives driving input from the second axle output

shaft; driving a first set of wheels with the first differential; driving a second set of wheels with the second differential; and determining rotational speeds of the first and second sets of wheels to identify the wheel slippage condition for activation of the clutch mechanism during step (d).

34. The method according to claim 33 including driving the second differential with power from the power source only when wheel slippage is identified in at least one of the first and second sets of wheels.

35. The transfer case assembly according to claim 15 wherein said second axle output shaft is only coupled to said first axle output shaft during a wheel slippage condition.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.